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**SEKIGUCHI TAKA!**

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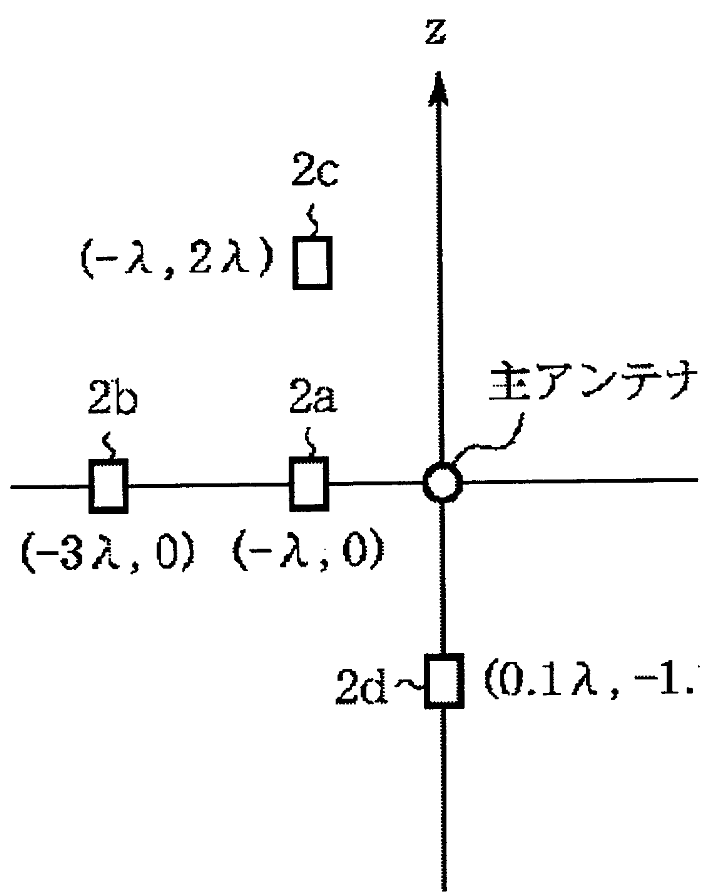
## (54) SIDE LOBE CANCELLER

(57) Abstract:

PROBLEM TO BE SOLVED: To obtain a side lobe canceller, the interference wave suppressing capability of which will not deteriorate, irrespectively of the incident directions of interference waves.

SOLUTION: This side lobe canceller is provided with a main antenna 1 and N pieces of auxiliary antennas 2-1 to 2-N, which are arranged so that the received signals of the four sets of the auxiliary antennas 2-1 to 2-N do not become primary subordinate signals, when at maximum N-2 kinds of interference waves are made incident.



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**Session 107 - Radio Astr nomy and VLBI Instruments.**
*Display session, Thursday, January 16*
*Metropolitan Ballroom,*

# [107.04] A New Method to Cancel RFI---The Adaptive Filter

*R. Bradley (NRAO), C. Barnbaum (STScI)*

An increasing amount of precious radio frequency spectrum in the VHF, UHF, and microwave bands is being utilized each year to support new commercial and military ventures, and all have the potential to interfere with radio astronomy observations. Some radio spectral lines of astronomical interest occur outside the protected radio astronomy bands and are unobservable due to heavy interference. Conventional approaches to deal with RFI include legislation, notch filters, RF shielding, and post-processing techniques. Although these techniques are somewhat successful, each suffers from insufficient interference cancellation. One concept of interference excision that has not been used before in radio astronomy is adaptive interference cancellation.

The concept of adaptive interference canceling was first introduced in the mid-1970s as a way to reduce unwanted noise in low frequency (audio) systems. Examples of such systems include the canceling of maternal ECG in fetal electrocardiography and the reduction of engine noise in the passenger compartment of automobiles. Only recently have high-speed digital filter chips made adaptive filtering possible in a bandwidth as large a few megahertz, finally opening the door to astronomical uses. The system consists of two receivers: the main beam of the radio telescope receives the desired signal corrupted by RFI coming in the sidelobes, and the reference antenna receives only the RFI. The reference antenna is processed using a digital adaptive filter and then subtracted from the signal in the main beam, thus producing the system output. The weights of the digital filter are adjusted by way of an algorithm that minimizes, in a least-squares sense, the power output of the system. Through an adaptive-iterative process, the interference canceler will lock onto the RFI and the filter will adjust itself to minimize the effect of the RFI at the system output. We are building a prototype 100 MHz receiver and will measure the cancellation effectiveness of the system on the 140 ft telescope at Green Bank Observatory.

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Program listing for Thursday